

WE CLAIM

1. Filter device (10) with

with filter elements (1a, 11a, 22a) which are by and large hollow cylindrical in shape and have inner ring wall openings (4) alternately stacked above one another, and filter elements (1b, 11b, 22b) having outer ring wall openings (3);

an outer housing (20), which along with outer ring walls (9) of the filter elements (1a, 1b, 22a, 22b, 11a, 11b) forms an outer housing fluid chamber (16) which ends into a second fluid pipeline (14);

a filter inner pipeline (18) which is formed by the inner ring walls (8) of the filter elements (1a, 1b, 22a, 22b, 11a, 11b) and is connected to the filter elements (1a, 11a, 22a) as well as to a first fluid pipeline (12) through the inner ring wall openings (4);

a by and large ring-shaped filter material (2) arranged between respectively two of these filter elements (1a, 1b; 11a, 11b; 22a, 22b),

whereby the filter elements (1a, 1b) are mainly hollow cylinder-shaped and have an inner ring wall (9) and an outer ring wall (8) as well as an upper and lower end face (34) with openings, whereby the filter elements have openings (3, 4) either at their radial outer wall (6) or inner wall (5),

whereby a fluid pipeline can be created from the inner pipeline (18) of the filter through inner wall openings (4) in the inner wall (5) of the hollow-cylindrical filter elements (1a) and through the end-side openings of the same through the ring-shaped filter material (2) and through the end-side openings into the next hollow-cylindrical element (1b) having outer openings and via its openings (3) arranged in the outer walls (6), into the filtrate chamber or housing chamber (16) or, in case of reverse flow, a fluid pipeline can be created from outside (16) to the inner pipeline (18),

a cover part (28) for tight sealing of the uppermost filter element; and

a base part (30) for closing the lowest filter element;

whereby the end faces (7) of the filter element (1a, 1b) mainly have flat peripheral outer sealing faces and inner sealing faces (53, 54), which on placing the filter elements (1a, 1b; 11a, 11b; 22a, 22b) on top of one another, come to lie above one another due to jamming in of filter material in between, and hence become uneven.

2. Filter device as per claim 1,
in which
the unevenness of the outer sealing edges and inner sealing edges have by and large the same roughness.
3. Filter device as per claim 1 or 2,
in which
the unevenness of the filter element is created by means of sand blasting, ball blasting, laser processing, milling.
4. Filter device as per one of the previous claims,
in which
the filter elements, the housing as well as the cover part and base part are made at least partly made of plastic.
5. Filter device as per one of the previous claims,
in which
the filter elements, the housing as well as the cover part and base part are made at least partly of metal, like steel.
6. Filter device as per claim 1 or 2,
in which
at least one strainer (7) is connected either before or after the filter material (2) in flow direction.
7. Filter device as per one of the previous claims,
in which

the cylinder-shaped element (1) is designed in multiple parts and consists of at least one inner ring and one outer ring (8, 9) and, if required, one or several strainers (5).

8. Filter device as per claim 3,
in which
at least one strainer (5) can be placed on the end face (7).
9. Filter device as per one of the claims 3 or 4,
in which
the filter material (2) is arranged at a distance to the strainer (5).
10. Filter device as per one of the claims 1 to 8,
in which
in the inner pipeline (18) a tie rod is provided, on which the hollow cylindrical filter elements (1a, 1b; 11a, 11b; 22a, 22b) and the ring-shaped filter material (29) are inserted and which is fixed in the upper cover cap and the lower cover cap (30) and hence tightens the filter elements/filter material stack.
11. Filter device as per claim 9,
in which
the cylinder-shaped filter elements (1a, 1b; 11a, 11b; 22a, 22b) have support walls (32) running radial to the axis of the inner pipeline (18) and vertically to the end faces (34) of the filter element (1).
12. Filter device as per one of the previous claims,
in which
the openings of at least one end face (34) of the hollow-cylindrical filter elements (1a, 1b; 11a, 11b; 22a, 22b) are shaped like holes and/or slots and/or in the form of strainers.
13. Flat filter material (2) for use in a filter device according to one of the previous claims,
in which
there is a holding region that has a different composition than in the filtering region.

14. Filter material for use in the filter device as per one of the previous claims,
in which
the edge region of the ring-shaped filter material is roughened.
15. Flat filter material (2) for use in a filter device as per one of the previous claims,
in which
there is individually or in combination, ceramic, metal, natural or synthetic polymers, synthetic resin-ion exchangers, polymers of halogenated hydrocarbons, teflon, porcelain, glass, metal, paper, cellulose, felt, leather, asbestos, glass, sawdust, pumice stone, titanium dioxide and, if required, is designed in two or more layers.
16. Flat filter material (2) as per one of the previous claims,
in which
the ring-shaped filter material (2) can be regenerated.